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ABSTRACT

This study investigated the relationship of standardized test scores and locally developed test scores to course placement and academic success in a developmental program. The sample consisted of 281 students who matriculated in the Division of Developmental Studies at a southern university. Eligible students for enrollment in Developmental Studies were those who were denied regular admission because they did not meet minimum admission standards. Students in the program are required to demonstrate proficiency in the course areas of English, reading, and mathematics before exiting the program. The variables are indices of performance that are used to place students in the appropriate developmental courses. Consistent across the three areas is the use of the high school grade point average (HSGPA), the Scholastic Aptitude Test (SAT) score, Basic Skills Examinations (BSE) designed and mandated for use by the University System Board of Regents, and supplemental tests. Results indicated that the SAT scores and HSGPA continue to be good predictors of academic performance. The BSE scores correlated highly with the appropriate SAT score and are of value for placement and prediction purposes. (DWH)

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The Validation of Variables Used in the Placement and Prediction of Academic Performance of Developmental Students

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The Validation of Variables Used in the Placement and Prediction of Academic Performance of Developmental Students

Through developmental or remedial programs, many colleges and universities admit students who have previously been denied access to higher education for such reasons as poor high school performance and low college aptitude test scores (Myers, 1983). In an attempt to assist students who indicate academic deficiencies for college work, such programs provide tutoring, counseling sessions, and academic remedial courses designed to prepare students to perform successfully in regular academic courses (Friedlander, 1980).

Academic success among developmental students as well as among regularly-admitted college freshmen has been shown consistently to be highly related to both high school performance and to academic aptitude as measured by the SAT or ACT (Hogrebe, 1982; Astin, 1971; Lavin, 1965). However, supplemental tests are often used to further assess a student's ability for placement purposes (Suddick and Collins, 1982; Michael and Shaffer, 1979). Identifying student academic weaknesses is essential if students are to be properly placed in courses in which success is most likely to occur.

This study investigated the relationship of standardized test scores and locally developed test scores to course placement and academic success in a developmental program. The test scores include Scholastic Aptitude Test Scores (The College Board), Basic Skills Examination (BSE) scores in English, reading, and mathematics (developed and mandated for use by the

Board of Regents of the University System of Georgia) the Arithmetic Skills and Elementary Algebra Skills tests of the Descriptive Tests of Mathematics Skills (DTMS) of the College Board (Educational Testing Service, 1979), a writing sample, and a retelling test and multiple choice test based on a reading sample. These scores are examined to determine how well they correlate with placement and to determine which instruments are the best predictors of academic performance. The criterion variables indicating academic performance are exit rate from developmental course work and final grade in first course enrolled in English, mathematics, or reading.

Methodology

Subjects

The sample consists of 281 students who matriculated in the Division of Developmental Studies at a large southern university (total enrollment over 20,000 students) during the 1983-84 academic year. To be eligible for enrollment in Developmental Studies, students were denied regular admission because they did not meet minimum admission standards.

Students in the program are required to demonstrate proficiency in the course areas of English, reading, and mathematics before exiting the program. Subjects are those students who enrolled in a course area and completed requirements in the area. Since students may complete requirements in course areas at different times, samples for each of the three areas of English, Reading, and mathematics differ. For English, the sample includes 187 students, 111 females and 76 males. The reading sample consists of 237 students of whom 129 are females and 108 are males; and

the mathematics sample consists of 116 females and 86 males for a total of 202 students.

Variables

The variables are indices of performance that are used to place students in the appropriate developmental courses. Consistent across the three areas is the use of the high school grade point average (HSGPA), the Scholastic Aptitude Test score (either SAT-Verbal or SAT-Mathematics), Basic Skills Examinations (BSE) designed and mandated for use by the University System Board of Regents, and supplemental tests. For each of the three areas, the criterion variables are placement in course, final grade in the first course taken in each area, and number of quarters needed to exit each particular course area.

The Basic Skills Examination in English is a multiple-choice test requiring knowledge of principles about grammar, usage, choice of words and phrases, and syntax. The supplemental test is a writing sample which is scored holistically on a scale from 1 (lowest) to 4 (highest).

The mathematics Basic Skills Examination includes both arithmetic and algebra questions. To supplement this test, students take the Descriptive Test of Mathematics Skills (DTMS) of the College Board (Educational Testing Service, 1979). Students who score less than 80% on the BSE take the Arithmetic Skills test and those who score 80% or better take the Intermediate Algebra Skills test.

The reading Basic Skills Examination is a multiple choice test of reading comprehension and includes items on vocabulary, inference, main

idea, and organization. As a supplement to the BSE, students read a section of college text and then retell the article in their own words (retelling test) and also answer multiple-choice questions about the article (multiple choice test).

Regarding the criterion variables, students place in one of four courses in each area: lowest level of ability (1) to more advanced level (4). Grade is based on students' grade in the course in which the student was initially placed and ranges from A (4 points) to F (0 points). Students have four quarters of course work in which to demonstrate proficiency in each area of English, reading, or mathematics; therefore, exit from course ranges from 1 to 4.

Analyses

The zero-order correlation coefficient (validity index) of each predictor variable relative to each criterion variable was determined for each of the three subject areas of English, reading, and mathematics. In addition, multiple regression analyses were run in each subject area to access the contributions of the independent variables to the two dependent variables of academic performance. In an attempt to determine which variables contributed significant amounts of unique variance to the prediction of academic performance demonstrated by exit from the subject area and by course grade, stepwise regression analyses were performed.

Results

The means and standard deviations for the samples in each of the three course areas -- English, reading, and mathematics -- are reported in Table 1. Each of the three groups indicated differences in characteristics entering a course as well as exiting a course.

The group which exited English was the smallest in number and reading was the largest. However, the mean SATV was higher for the English group than for the reading group. The HSGPA was relatively consistent across all three groups. Although the BSE tests were different for each area, it was interesting that for the areas of English and mathematics the mean BSE score upon entering the program was above the minimum score needed to exit the course area, 69 and 80 respectively. In reading, the BSE score was slightly less than the 69 minimum score.

Regarding course grades, the mean grade was highest for the first mathematics course taken and lowest for English. Also, students tended to initially place in higher course levels in mathematics and complete mathematics course requirements in less time. The variability in placement was highest for reading. Placement in the English program varied slightly as indicated by the small standard deviation, first course grades were lower, and the mean time to complete requirements was longer.

Insert Table 1 about here

The correlations among the predictor and criterion variables are reported in separate tables for each of the three areas and are discussed separately. However, consistent across the three areas was the negative correlation between HSGPA and any of the test scores. These negative correlations are due to the uniqueness of developmental students. Such students tend to have discrepancies betwen test scores and performance in course work, either obtaining a low SAT score and adequate high school grade point averages or a high SAT score but low grade point averages. Correlations for the criterion variable, exit from course, were also negative since students with higher scores are likely to exit in a lower number of quarters. For the sake of clarity, however, the negative signs related to exit from course were removed.

Correlations for the English group are in Table 2. The intercorrelations among the test variables (SAT-V, BSE-English, and writing sample) indicated predominately low to moderate relationships; however, the correlations were not so high as to indicate excessive redundancy. The relationships of the SAT-V score and the BSE-English scores to placement, grade in first course taken, and exit from English were also moderate with the BSE-English tending to be a stronger relationship. However, the relationships of the writing sample to placement, $\underline{r} = .18$, and to exit, $\underline{r} = .17$, were not statistically significant and the relationship to grade was low, $\underline{r} = .21$. For the criterion measures of grade in first course and exit, the BSE-English was the most valid predictor as evidenced by respective valildity coefficients of .37 and .40.

Insert Table 2 about here

The intercorrelations related to reading are in Table 3. The relationships among the test score variables were all statistically significant at the .01 level; however, the relationship between SAT-V and BSE-Reading was particularly strong, r = .63. The relationships between the retelling test and the other tests were moderate: SAT-V, .27; BSE-Reading, .20; and Multiple Choice test, .21. The strongest indicators of course placement were SAT-V, r = .49; BSE-Reading, r = .56; and the Multiple Choice test, r = .62, all relatively high relationships.

With respect to academic success, the BSE-Reading appeared to be the most valid predictor of grade in first course and completion of requirements for exiting. The respective coefficients were .33 and .38.

Insert Table 3 about here

Table 4 contains the correlations among the variables related to mathematics. The BSE mathematics exam correlated strongly with the SAT-M and moderately with the arithmetic and algebra tests. There was no basis for correlation between the algebra and arithmetic tests since students take one or the other. This procedure obviously affects the placement

process since students who need arithmetic skills place in lower level courses than those who need algebra skills. The most valid overall predictor of placement, therefore, appeared to be BSE-Mathematics with a coefficient of .51.

The only statistically significant predictors of grade in first math course were HSGPA (.21) and BSE-M (.19), neither of which were very strong relationships. There was no significant correlation between SAT-M and grade. The most valid predictor for exit from math was the BSE mathematics, r = .48.

Insert Table 4 about here

The results of the regression analyses indicated that only BSE-English and SAT-V contributed a significant amount of unique variance to exit from English, accounting for 19% of the variance, $F(4,178) = 11.58, p = .0001$ (Table 5).

The writing sample was the only variable which did not contribute significantly to the prediction of grade in first English course. The BSE-English, HSGPA, and SAT-V contributed 18% of the variance in estimating grade, $F(4,177) = 10.46, p = .0001$ (Table 6).

Insert Tables 5 and 6 about here

Although the stepwise regression analysis indicated that BSE-Reading initially contributed the most variance in predicting exit from reading, SAT-V and HSGPA were statistically significant at the .01 level while BSE-Reading was significant at the .05 level. Taken together the three variables accounted for 19.5% of the variance, $F(5,226) = 12.18, p = .0001$ (Table 7).

The three variables also accounted significantly to grade in first reading course, $F(5,224) = 10.76, p = .0001$ (Table 8). Neither the Retelling test nor the Multiple Choice test contributed a significant amount of unique variance to the estimate of grade in first reading course or to exit from reading over and above the other three instruments.

Insert Tables 7 and 8 about here

Regarding the subject area of mathematics, only the Algebra Test contributed significantly to the prediction of exit from mathematics over and above the other variables. The Algebra Test accounted for 8% of the variance, $F(4,100) = 3.13, p = .0179$ (Table 9). High school GPA and SAT-M accounted for a significant amount of variance (8%) in estimating course grade in mathematics, $F(4,99) = 3.55, p = .0095$ (Table 10).

Insert Tables 9 and 10 about here

Discussion

Although there was little variability in the placement of students in English courses, the SAT-V and the BSE-English were the most valid measures of determining the developmental course in which students should enroll. The two tests were also the best predictors of exit from the English program and contributed significantly to the prediction of grade in first English course. Neither the writing sample nor the HSGPA contributed significantly to placement practices nor to exit from the program. It is not surprising, however, that performance in course work as measured by the HSGPA contributed significantly to an estimate of grade in first English course. It is reasonable to expect that a student's academic performance in the past should have a good probability of continuing in a future time such as in college.

The SAT-V, the BSE-Reading, the Multiple Choice test, and the Retelling test were all valid indicators of placement in reading courses. The moderate relationship of the Retelling test to the other test variables indicate that it may be an unique contributor since there may be some overlap among the other three variables. However, it is relatively difficult and time-consuming to score. The SAT-V, the BSE-Reading, and the HSGPA contributed significantly to estimates of grade in first course taken and of exit from reading. Both the Retelling test and the Multiple Choice test failed to contribute significant amounts of variance to the dependent variables when all five measures were entered into the regression equations.

Regarding the placement of students in mathematics courses, the SAT-M, the BSE-Math, the diagnostic tests of Arithmetic Skills and Algebra Skills all significantly relate to the placing of students. Not surprisingly, performance on the Algebra test contributes the most variance to an estimate of prediction of exit from math courses since knowledge of algebra is a requisite for exiting the subject area. As in the other two subject areas, the HSGPA is a significant contributor to the prediction of grade in first mathematics course.

Of particular interest is information ascertained from the study regarding the Basic Skills Examinations (BSE). The University System Board of Regents mandates the use of the BSE as an indicator of competence for placement purposes and to determine when a student is prepared to compete with other freshmen and thus can exit developmental work. Its high correlation with the SAT-V and the SAT-M and evidence of its validity in placing students and predicting academic success give additional credence to its value as an instrument to be used with developmental students within the state.

Conclusion

In summary, the results of this study indicate that the SAT scores and high school grade point averages continue to be good predictors of academic performance. Of special interest to program administrators within the state is the indication that the Basic Skills Examinations correlate highly with the appropriate SAT score and are of value for placement and prediction purposes. In the area of English, the writing

sample does not appear to contribute to either the placement procedure nor to the prediction of academic performance over and above the other instruments. However, since the mean BSE-English score is so high for students entering the program, the availability of a writing sample might help identify those students who perform satisfactorily on a multiple choice test of writing ability but have poor actual writing skills. Regarding the area of reading, the Multiple Choice test and the Retelling test, designed to assist in the placing of students, are valid indicators of placement along with the SAT-V and BSE-Reading. However, the two locally constructed tests do not contribute significantly to an estimate of exit or grade over and above HSGPA, SAT-V, and BSE-Reading. In mathematics, results indicate that the instruments currently being used are valid in the placing of students. The DTMS-Algebra test contributed a significant amount of variance to an estimate of exit from the course area; and HSGPA and SAT-M contributed significantly to grade in first course.

Since the testing of students to determine placement takes approximately six hours, the writing sample and the Retelling test require the expertise of professionals for scoring, and from the standpoint of cost effectiveness, Program administrators might consider examining more closely the merits of the SAT scores, HSGPA, and BSE scores in placing students, especially in the areas of English and reading.

Table 1

Means and Standard Deviations of Variables

Variables	M	SD
ENGLISH n = 187		
SAT-V	385.94	58.41
HSGPA	2.63	.40
BSE-English	75.08	8.28
Writing Sample	2.01	.64
Placement in English Course	1.97	.16
Grade in First English Course	2.10	.93
Exit from English Course	1.76	.74
READING n = 237		
SAT-V	376.16	58.93
HSGPA	2.61	.39
BSE-Reading	68.37	6.82
Multiple Choice Test	9.15	1.98
Retelling Test	11.70	6.11
Placement in Reading Course	2.28	.96
Grade in First Reading Course	2.65	.88
Exit from Reading Course	1.55	.70
MATH n = 202		
SAT-M	424.70	63.03
HSGPA	2.65	.40
BSE-Mathematics	80.55	8.27
Arithmetic Test	28.09	3.89
Algebra Test	15.74	3.55
Placement in Math Course	2.78	.67
Grade in First Math Course	3.15	.83
Exit from Math Course	1.34	.62

Table 2
Correlations Among Predictor and Criterion Variables Related to English

	HSGPA	BSE English	Writing Sample	English Placement	Grade	Exit from English[a]
SAT-V	-.44*	.27*	.30*	.35*	.23*	.28*
HSGPA		-.00	-.05	.09	.12	.03
BSE-English			.24	.27*	.37*	.40*
Writing Sample				.18	.21*	.17
Placement					.27*	.19*
Grade						.79*

[a]Negative signs were omitted.
*Significant at .01 level.

Table 3
Correlations Among Predictor and Criterion Variables Related to Reading

	HSGPA	BSE Reading	Mult. Choice	Retell	Reading Placement	Grade	Exit from Reading[a]
SAT-V	-.36*	.63*	.42*	.27*	.49*	.28*	.34*
HSGPA		-.09	-.08	-.03	-.10	.17*	.11
BSE-Reading			.44*	.20*	.56*	.33*	.38*
Multiple Choice Test				.21*	.62*	.24*	.29*
Retelling Test					.38*	.21*	.20*
Placement						.25*	.26*
Grade							.76*

[a]Negative signs were omitted.
*Significant at .01 level.

Table 4
Correlations Among Predictor and Criterion Variables Related to Mathematics

	HSGPA	BSE Math	Arithmetic	Algebra	Math Placement	Grade	Exit from Math[a]
SAT-M	-.52*	.58*	.33*	.15	.36*	.08	.33*
HSGPA		-.23*	-.07	-.25	-.11	.21*	.07
BSE-Math			.45*	.33*	.51*	.19*	.48*
Arithmetic Test				.00	.64*	.14	.29*
Algebra Test					.44*	.15	.27*
Placement						.16	.41*
Grade							.57*

[a]Negative signs were omitted.
*Significant at .01 level.

Table 5

Final Equation Based on Predictors for English Exit

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
BSE-ENGISH	.1564	.1564	21.59	1	181	.0001**	-.0290
SAT-V	.1889	.0233	9.55	1	180	.0023**	-.0032
HSGPA	.2059	.0160	3.71	1	179	.0558	-.2679
Writing Sample	.2065	.0006	.13	1	178	.7239	-.0290

Note: Intercept = 5.9534

[a] F-test is for the increase in R^2.

[b] Weights are derived with all four variables in the equation

** $p < .01$

Table 6

Final Equation Based on Predictors for English Grades

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
BSE-English	.1320	.1320	16.53	1	180	.0001**	.0321
HSGPA	.1642	.0322	7.45	1	179	.0070**	.4799
SAT-V	.1831	.0189	5.91	1	178	.0160*	.0032
Writing Sample	.1912	.0081	1.77	1	177	.1848	.1380

Note: Intercept = -3.0779

[a] F-test is for the increase in R^2.

[b] Weights are derived with all four variables in the equation.

** $p < .01$

* $p < .05$

Table 7

Final Equation Based on Predictors for Reading Exit

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
BSE-Reading	.1330	.1330	-2.230	1	230	.0267*	-.0181
SAT-V	.1518	.0188	-2.881	1	229	.0043**	-.0029
HSGPA	.1954	.0436	-3.386	1	228	.0008**	-.3969
Multiple Choice	.2051	.0097	-1.494	1	227	.1366	-.0360
Retelling	.2122	.0071	-1.430	1	226	.1542	-.0102

Note: Intercept = 5.3863

[a] F-test is for the increase in $\underline{R}$.

[b] Weights are derived with all four variables in the equation.

**$\underline{p} < .01$

*$\underline{p} < .05$

Table 8

Final Equation Based on Predictors for Reading Grades

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
BSE-Reading	.1038	.1038	2.115	1	228	.0355*	.0218
HSGPA	.1430	.0392	4.057	1	227	.0001**	.6028
SAT-V	.1751	.0321	2.347	1	226	.0198*	.0031
Retell	.1896	.0145	1.874	1	225	.0623	.0169
Multiple Choice	.1936	.0040	1.065	1	224	.2880	.0326

Note: Intercept = -2.0628

[a] F-test is for the increase in $\underline{R}$.

[b] Weights are derived with all four variables in the equation.

**$\underline{p} < .01$

*$\underline{p} < .05$

Table 9

Final Equation Based on Predictors for Mathematics Exit

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
Algebra	.0777	.0777	-2.745	1	103	.0072**	-.0278
SAT-M	.0947	.0170	-1.707	1	102	.0910	-.0012
HSGPA	.1109	.0162	-1.350	1	101	.1801	-.1504
BSE-Math	.1114	.0005	-.225	1	100	.8227	-.0015

Note: Intercept = 2.6018

[a] F-test is for the increase in $\underline{R}^2$.

[b] Weights are derived with all four variables in the equation.

** $\underline{p} < .01$

Table 10

Final Equation Based on Predictors for Mathematics Grade

	R^2	ΔR^2	F[a]	df_n	df_d	P	b-weight[b]
HSGPA	.0594	.0594	9.94	1	102	.0021**	.6808
SAT-M	.0851	.0257	5.62	1	101	.0197*	.0032
Algebra	.1234	.0383	3.40	1	100	.0680	.0367
BSE-Math	.1253	.0019	.22	1	99	.6438	.0060

Note: Intercept = 2.6018

[a] F-test is for the increase in $\underline{R}^2$.

[b] Weights are derived with all four variables in the equation.

** $\underline{p} < .01$

* $\underline{P} < .05$

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Abstract

This study investigated the relationship of standardized test scores and locally developed test scores to course placement and academic success in a developmental studies program. The examination was conducted to determine which test scores instructors tended to use for placement, how well the tests correlated with placement practices, and which test scores appeared to be the best predictors of academic performance. The criterion variables indicating academic performance were exit rate from developmental course work and course grade.